IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Sato

Serial Number: 09/807,214 Group Art Unit: 1745

Filed: August 8, 2001 Examiner: Julian A. Mercado

Title: ELECTRODE STRUCTURE, ELECTRIC COMPONENTS AND MANUFACTURING METHOD

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DECLARATION BY APPLICANT
REGARDING
ION AND ELECTRONIC CONDUCTIVITY

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1453

February 27, 2006

Commissioner:

I, Takaya Sato, being first duly sworn, on oath makes the following statement and declaration of facts:

I am a joint inventor of the above-identified patent application (the "subject application").

Currently, I am a professor of Tsuruoka National College of Technology. I attended Shinshuu University, where I obtained a Masters degree in Chemistry, and then I obtained my PhD from Kyoto University in 1992. After graduation, I worked for Nisshinbo over nineteen years and during my time there I involved in significant research, development and testing in the electrochemistry and polymer fields. I had also been involved in the creation and invention of several kinds of products in the polymer and electromechanical device fields, thereby utilizing my technical experience and background. Through my experience I have become well aware of the standards and terminology used in the battery and capacitor industry and have filed patent applications in the polymer science field. In the same field of art I have filed numerous domestic, Japanese patent applications throughout my nineteen years with Nisshinbo and have had about thirty patents issued in Japan in the same field of art. I have also filed 44 United States patent applications in the same field of art since the year 1985 and have had 20 patents issued in the United States.

I read the office action issued on serial number 09/807,214 mailed on November 2, 2005. Even after reading and carefully examining the examiner's office action and materials suggested by the examiner, Encyclopedia of Smart Materials, Volume 1 and Volume 2, Mel Schwartz, John Wiley & Sons, Inc. (hereinafter Encyclopedia of Smart Materials, I still concluded that polyaniline does not have ion-conductivity.

Electric Conductivity of Electronic Conductive Polymer

"Ion conductivity" in the chemical field as well as in this application means the condition that ions migrate between polymer chains to obtain the electric conductivity

where conductivity occurs due to the migration of ions with mass. Unlike electronic conductivity of carrier, i.e., free electron or electron/positive hole, such as carbon black and polyanline, ions migrate according to the mobility (spot/local activity) of macromolecule as solvating ions in the macromolecule site, thereby obtaining the electric conductivity.

The electronic conductive polymers simply mean polymers having conjugated double bond showing electric conductivity by doping, e.g., polyacethylene, polypyrrole, or polyaniline. These polymers when doped in halogen and Lewis acid cause reaction between the polymers and the additive, thereby generating electron/positive hole. This electron/positive hole becomes the carrier and causes the electric conductivity. This is called p-type doping.

Halogen: Cl_2, Br_2, I_2, ICl_3, IBr, IF_3

Lewis Acid: PF5, AsF5, SbF5

Here, the doping material reacts with the polymer to generate the electron/positive hole or free electron; however, the doping material itself has mobility within electrolyte but does not provide electric conductivity.

Understanding of Encyclopedia of Smart Materials

The second paragraph in "SYNTHESIS AND PROPERTIES" in the second column of page 297 in "Encyclopedia of Smart Materials" states "the dopant action A^- is electrostatically attached."

Here, the ions cause chemical reaction as boned with polymers and generate the carrier. To sum, the ions is bonded with the polymers to become non-migratable and instead generate the carrier. This migrates on the conjugated system PAI

electron orbit to provide conductivity. Therefore, if the dopant is once attached, the dopant cannot migrate. Accordingly, it must logically and commonly be understood that no ion-conductivity can exist.

Furthermore, in "Encyclopedia of Smart Materials", on lines 13-14 in the first column of page 280, MA salt or HA acid (i.e., material of ion) is incorporated to cause reaction between the dopant and polymer to generate carrier. On lines 12-14 in the second column of page 280, "The doped oxidized form exhibit good electrical conductivity..., while the reduced forms have very low conductivity..." In other words, conductivity occurs only when being bonded with polymers. The chemical formula showing these phenomena is FORMULA (1) appeared in page 281. Here, the polymer and dopant (A^-) reacted and "+" over polymer shows polymer/positive hole (carrier). The condition that A- does not react with the polymer, i.e., the condition that A^- is being detached from the polymer (de-doping), shows the mixture of A^- and the polymer/positive hole quenched polymer, and therefore no mechanism of conductivity via polymer exists. That is, this FORMULA (1) is nothing to do with ion conductivity.

What is Ion Exchange Capacity

In "Encyclopedia of Smart Material", the polymer with many carrier generated by doping is shown as "high ion exchange capacity". However, "high ion exchange capacity" and ion conductivity is totally different.

Conclusion

Doping effect for the electronic conductivity causes the doped material is fixed at the doped location, and polyaniline is an example thereof. The doped material is

fixed in the polymer and therefore the doped material cannot migrate therein. That is, (oxidant) of polyaniline is an electronic conductive material but NOT ion conductive material. This fact is obvious from "Encyclopedia of Smart Materials"

I hereby declare that all statements made herein are of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Takaya Sato, PhD

February 22, 2006
Date

Yamagata, Japan
Place